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Distinct Impacts of Increased Aerosols on Cloud Droplet Number Concentration of Stratus/Stratocumulus and Cumulus

Hailing Jia^{1,2}, Xiaoyan Ma¹, Fangqun Yu², Yangang Liu³, and Yan Yin¹

¹Nanjing University of Information Science & Technology, School of Atmospheric Physics, China (jiahl@nuist.edu.cn)

²Atmospheric Sciences Research Center, University at Albany, Albany, NY, USA

³Environmental and Climate Sciences Department, Brookhaven National Laboratory, Upton, NY, USA

In situ aircraft measurements obtained during the RACORO field campaign are analyzed to study the aerosol effects on different cloud regimes. The results show that with increasing cloud condensation nuclei (CCN), cloud droplet number concentration (N_d) significantly increases in stratocumulus (Sc) while remains almost unchanged in cumulus (Cu). By using a new approach to strictly constrain the dynamics in Cu, we found that neither simultaneously changing cloud dynamics nor dilution of cloud water induced by entrainment-mixing can explain the observed insensitivity of N_d . The different degree of reduction in cloud supersaturation caused by increasing aerosols might be responsible for the observed different aerosol indirect effect between Sc and Cu.